"NEW ALGORITHM FOR FACE RECOGNITION SYSTEM FOR ENHANCED FEATURE EXTRACTION"

SYNOPSIS

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Abstract

Now a day's biometric is a currant topic for the research community. Biometric is used for security purpose for its real time applications. Face recognition is one of the challenging issues in biometrics. These issues in our mind, we are focusing on the face recognition problems. Face recognition must address several difficult problems such as pose, illuminations and expression, background imaged head size, and head orientation. This difficulty arises from the fact that faces must be represented in a way to distinguish a particular face from all other faces. Face recognition system consists of four modules: face detection, face normalization, face feature extraction and matching. The face recognition process can be operated in face verification, face identification and face watch. In face verification a query face image is compared against a template face image whose identify is being claimed. In fact identification a query face image is compared against all templates in the database to determine the claimed identify. In face tracking and surveillance, face images are tracked and compared with stored databases. Our study is focus on analysis the various face recognition algorithms and investigate to propose the face recognition algorithm with its enhanced performance.

Keywords: Face Recognition, Face Detection, biometrics, PCA, ICA, SVM, ORL etc.

1. Introduction to Biometric

The term biometrics is derived from the greek words bio means life and metrics means measurement. Biometrics refers to the measurement and analysis of physical or behavioral traits of human beings. Biometric can be defined as a set of distinctive, permanent and universal features recognized from human physiological or behavioral characteristics. A number of biometric characteristics exist and are in use in various applications. Each biometric has its strengths and weakness, and the choice depends on the application.

There are various biometric identity verification techniques which have surfaced from time to time, including face recognition. Face recognition is a nonintrusive method, and facial images are probably the most common biometric characteristic used by humans to make a personal recognition. The applications of facial recognition range from a static, controlled and uncontrolled face identification in a cluttered background. The most popular approaches to face recognition are based the location and shape of facial attributes. The overall analysis of the face image that represents a face as a weighted combination of a number of canonical faces. While the verification performance of the face recognition systems that are commercially available is reasonable, they impose a number of restrictions on how the facial images are obtained, sometimes requiring a fixed and simple background or special illumination.

2. Design Issue in Biometric System

The biometric traits can be used as biometric characteristics to identify an individual as long as it satisfies the following parameters. There are at least different biometric techniques commercially available and new techniques are in the stage of research and development. Any human physiological or behavioral characteristics can become a biometric provided the following properties are fulfilled:

- **Universality**: The human beings must have some common body parts such as face, finger, palm, iris etc. It is really difficult to get 100% coverage. There are mute people, people without fingers or with injured eyes. A good biometric system should handle all the types of people.
- **Collectability**: The features of human body parts are acquired and quantitatively measured. Face recognition systems are not intrusive and obtaining of a face image is easy. In the contrast the DNA analysis requires a blood or other bodily sample. The retina scan is rather intrusive as well.
- **Distinctiveness**: The patterns of each biometric trait of any two persons in the world should be distinct and different in terms of both physiological and behavioral characteristics.
- **Permanence**: The physiological and behavioral characteristics of biometric traits should not change over a period of time pertaining to recognition criterion. While the iris usually

remains stable over decades, a person's face changes significantly with time. The signature and its dynamics may change as well and the finger is subject to injuries.

- **Acceptability**: In general people need to accept a particular biometric identifier for day-to-day business or any related transactions.
- **Uniqueness**: The biometric characteristic that differentiate effectively between persons. Sometimes biometric traits like face recognition, DNS etc., may be not useful for the identical twins.
- **Circumvention**: This refers to how difficult it is to fool the system by fraudulent techniques. An automated access control system that can be easily fooled with a fingerprint model or a picture of a user's face does not provide much security.

3. Introduction to Face Recognition:

Face recognition technology that allows industry and governmental customers to prevent identity fraud, secure borders and support physical access control. Face is most commonly used biometric to recognize people. It works with the most obvious individual identifier the human face. In recent years, face recognition research has attracted more and more attention from academic and industry. Recognizing a face based on its attributes is an easy task for a human to perform. It is nearly automatic and requires little mental effort. Face biometric is a challenging field of research with various limitations imposed for machine face recognition like variations in face pose, changing in illuminations, facial expression, aging, as a person wearing glasses etc…, various approaches were suggested by researchers in overcoming the limitations stated.

Face recognition must address several difficult problems such as pose, illuminations and expression, background imaged head size, and head orientation. This difficulty arises from the fact that faces must be represented in a way to distinguish a particular face from all other faces. Face recognition system consists of four modules: face detection, face normalization, face feature extraction and matching. The face recognition process can be operated in face verification, face identification and face watch. In face verification a query face image is compared against a template face image whose identify is being claimed. In fact identification a query face image is compared against all templates in the database to determine the claimed

identify. In face tracking and surveillance, face images are tracked and compared with stored databases.

Fig. Face Recognition

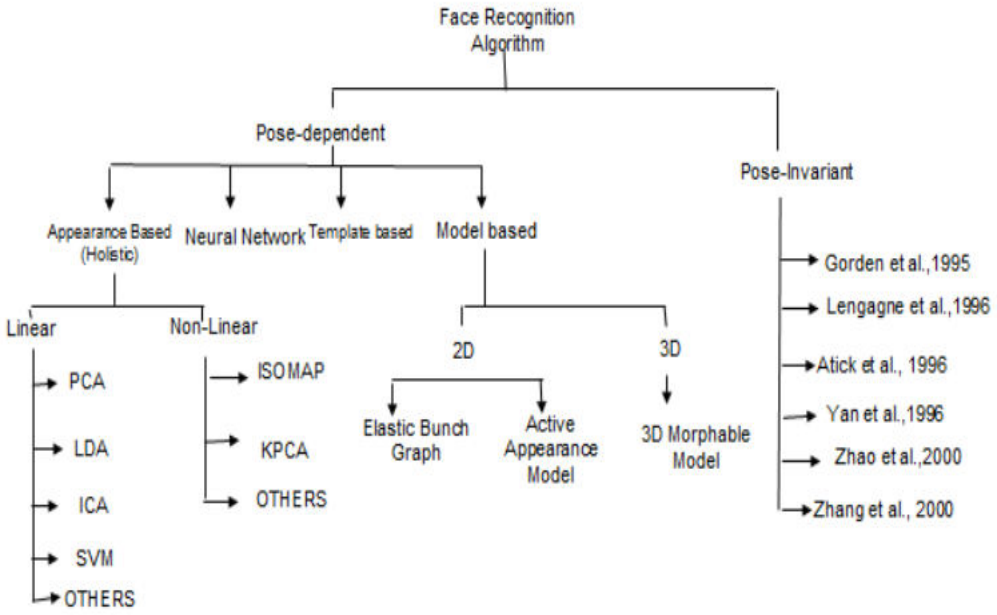
Face Detection is the first stage in identification process, face detection is viewed as a two class classification face and non face. Detecting faces from an image may be subjected to various limitations such as illumination problem, pose variations, occlusions due to accessories etc. Various approaches like holistic, template, geometric based were used to address the limitations that are stated. The techniques used were able to resolve only few of the limitations. Using combination of techniques promising results were seen. Geometrical features of the face are extracted from eyes, shape of mouth, face boundary etc. and are organized as graph for modeling and recognition. The various face detection techniques are suggested.

Face modeling generates a learned face model of a person and stores it in the database for verification. Face modeling is an integral part of face recognition. In face modeling, facial shape is integrated with distinctive facial features to give a realistic face model. Face modeling simplifies in describing the complexity of face geometry.

Extraction of facial features is an integral process involved in face detection, face modeling, face recognition, facial expression determination, model based image coding etc. Facial feature extraction is sensitive to noise, variations in illuminations and pose. Various approaches were used to address these problems. Geometric based, colour segmentation based, appearance based, template based techniques are used to increase the performance of the face recognition system. In automatic face recognition system, face image is detected, features are extracted, and identified. The most common approaches used are geometrical based techniques, template based techniques face geometrical configuration is considered for feature extraction.

4. Literature Review

There are number of face recognition algorithm are available for face recognition.



In 1995 Chellappa and in 1997 Zhang and Chan in 1998 to proposed a face recognition algorithm for video database to find out shots of particular people. In 1993 Haibo Li was proposed a face recognition algorithm for real time video conferencing application with a compact parameterized facial model.

In 2000 Yambor is analyzed and proposed automated eigenvector selection using PCA based approach. He studied the combination of traditional distance measures and to

improve performance of face recognition. In 2001 Moon investigates algorithm using PCA for FERET database to examine the eigenfaces performance with change illumination, varying the number of eigenvector and changing the similarity in the classification process. In 2005 Chichizola proposed a new algorithm known as Reduced Image Eigenfaces (RIE) to improve the accuracy rate in face recognition process. In 2002 Lemieux and in 2004 Ibrahim respectively implement several image processing steps such as segmentation, deskewing, zooming, rotation and warping for to observe the eigenfaces capability.

In 2005 anil Kumar Jain and his team proposed a face recognition algorithm for image using PCA and FSVM. The proposed method used for skin color to detection of faces within

color image. Experiments were conducted using the indoors photograph. The results in the proposed method were more accurate. The proposed method is efficient for the frontal face detection and recognition algorithm.

In 2007 El-Bakry 2007 has proposed a new PCA based face detection algorithm. This algorithm is based on cross-correlation in the frequency domain between the input image and eigenvectors. This algorithm increases detection accuracy over normal PCA algorithm in the spatial domain .

In 2008 Anil kumar Jain and his team implement a face recognition algorithm using multi scale PCA and SVM. This proposed method increase recognition performance using reorganizing the Gabor feature, reducing the dimension with MS-PCA and classifies SVM. This algorithm has two limitations. The first limitation is difficult to select the Kernel Parameters settled in some degree. Second limitation is more number of SVM classifier are used. The computing time using this algorithm is less because feature recognition technique is used.

In 2011 Naik and Kumar introduced an ICA based Blind Source Separation (BSS) algorithms. The mathematical framework of the source mixing problem that ICA and BSS addresses is examined. In this algorithm examine the important preprocessing steps of centering and whitening.

In 2011 Naik and Kumar proposed new algorithm based on PCA and Support Vector Machine for face recognition. In this method face recognition is done using PCA

as feature extractor and SVM is as classifier. Experiments have done using this algorithm on Cambridge ORL database. This method compares with PCA and nearest neighbors (NN) methods of face recognition. The recognition rate of this method is better than other two methods (PCA+NN and SVM). This method is benefited for small sample of training database.

5. Motivation

Face recognition systems are computer based security systems that are able to automatically detected and identify human faces. These systems depend on a recognition algorithm. The first step for a facial recognition system is to recognize a human face and extract it from the rest of the scene. There are several reasons that cause face recognition systems to fail,

such as pose change, expression variations, age changes, occlusions, etc. Hence it is very difficult to get a handle on the most advanced level of technology. Variations in pose of the same user from one system to the next cannot be avoided.

6. Problem statement

Face recognition plays an important role in today's emerging technologies. They have many real world applications like security and surveillance applications include identity verification. Howerver, research in this field is still developing. Recognizing the face image heavily depends on the choice of features used by the classifier with a given set of features and then attempt derive a best possible subset of features leading to high classification performance with the expectation that similar performance can also be displayed on future trials using unseen test data.

Humans can recognize face even when the matching image is distorted, such as a person wearing glasses, and human can perform the task fairly easy. Using the present technology it is impossible to completely model human recognition system and reach its performance and accuracy. Howerver, the human brain has its shortcomings in some aspects. The benefit of a computer system would be its capacity to handle large amount of data and ability to do a job in a predefined repeated manner. The observations and findings about human face recognition system will be a good starting point for automatic face attribute analysis.

7. Research Objectives

The problem of face detection in still images is more challenging and difficult since emotion information can lead to probable regions where face could be located. This research is to describe a new approach to face recognition system.

- Study the existing face recognition algorithm and its performance.
- Comparative analysis of face recognition algorithms.
- Design fusion based face recognition algorithms.
- To purpose the face recognition algorithm with its increasing performance.
- Our study deals with face recognition based on different face recognition algorithms on the basis of feature extracted from the face by using image processing techniques.
- To investigate how to improve the existing methods of face recognition.

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